

察シタル BÖRGESSEN ハコレハ恐ラク *Liagora* ノ體トハ何等關係ノナイモノデ恐ラク獨立ノ生物デハナイカトノ疑ヲイダキ更ニカナリ一島ニ於ケル。最近ニハ又東印度産ノ種ニツイテモ此ノ屬ノモノニハ全クコノ “disc” ヲ見出シ得ナカツタコトラ氏ノ考ノ一證左トシテ述ベテキル。

筆者ハコノ論ノ是非ニ就テハ此處ニ論ズル資格ヲ有セザルヲ遺憾トスル。何トナレバ筆者ノ檢シ得タ多數ノ標本ニ就テハ勿論同ジク此ノ小體ヲ觀察シ得タノデアアルガ、而シテ又此等上述ノ議論ニ關シテ特別ナル注意ヲ拂ツタノデアツタガ、ソレニモカ、ハラズ HOWE ノ述ベルガ如キ適當ナル材料ニ遭遇スルヲ得ズ。サレバト云ツテ今遽カニコレヲ獨立ノ生物ナリト斷定スルダケノ積極的ナル理由モ又勇氣ヲモ持合ハサナイ。

何シロ今迄ニ報ゼラレタコノ小體ヲ有スル種ハ *L. farinosa* LAMX. (*L. elongata* ZAN., *L. Cheyneana* HARV., 等ヲ含ム意ノ)、*L. ceranoides* LAMX., *L. valida* HARV., *L. pinnata* HARV., *L. Turneri* ZAN. 等デアツテ、本邦産ノモノデハ *L. clavata* m. ふくれこなはだ。 *L. farinosa* LAMX. けこなはだ等ニ見ラレル。

## On the Ovular Structure in the Ranunculaceæ and Berberidaceæ.

By

Masao KUMAZAWA

熊澤正夫：うまのあしがた科並ニめぎ科植物ノ卵子ノ構造

The features of ovules as well as of the carpels are systematically significant, and in the system of ENGLER-DIELS (1936) the ranunculaceous genera are divided in regard to carpellar and ovular characters as follows;

- A. Samenanlagen zu beiden Seiten der Bauchnaht der Karpelle, selten einzeln. Balgfrucht mit  $\infty-1$  Samen, selten Beere oder Kapsel, nur bei *Callianthemum* einsamige Schliessfrucht.

Samen mit mächtigen äusserem Integument, welches das innere weit überragt. .... Hydrastideæ, Paeonieæ

Das äussere Integument der Samenanlage nicht länger als das innere ..... Helleboreæ

- B. Samenanlage einzeln am Grunde der Bauchnaht, oft noch rudimentäre an den Seiten derselben. Schliessfrüchte einsamig. .... Anemoneæ

These characters, which were taken by PRANTL (1891) for the characteristics of the ranunculaceous tribes, will be re-examined in this paper. The genera studied by the present writer are as follows; *Paeonia* (Paeoniæ), *Glaucidium*, *Hydrastis* (Hydrastideæ), *Caltha*, *Trollius*, *Helleborus*, *Eranthis*, *Nigella*, *Isopyrum*, *Coptis*, *Xanthorhiza*, *Anemonopsis*, *Cimicifuga*, *Actaea*, *Aquilegia*, *Semiaquilegia*, *Delphinium*, *Aconitum*, *Callianthemum* (Helleboreæ), *Anemone*, *Hepatica*, *Pulsatilla*, *Trautvetteria*, *Clematis*, *Ranunculus*, *Thalictrum*, *Anemonella*, *Adonis*, (Anemoneæ); *Berberis*, *Mahonia*, *Epimedium*, *Caulophyllum*, *Ranzania*, *Plagiorhegma*, *Achlys*, *Nandina*, *Podophyllum*, *Diphylleia* (Berberidaceæ).

Almost all these genera have been studied with the fresh plants cultivated by the writer himself.

## I. The Ovular Position and Mode of Attachment.

### A. Ranunculaceæ.

In this family, the ovular position is marginal-lateral or marginal-median as was shown by TROLL (1932). The tribes Paeoniæ, Hydrastideæ and Helleboreæ belong to the former type in which numerous ovules are usually inserted in the lateral margins of the carpel. Each carpel is usually supplied with three separated bundles—two ventrals (laterals) and one dorsal (median); the ovular traces occur from the two ventrals. The tribe Anemoneæ, however, belongs to the latter type, in which a single ovule is inserted in the median margin of the carpellar lamina of peltate nature. The carpellar trace occurs from the receptacle as a single bundle and divides into two—one dorsal and one ventral. In most genera of the Anemoneæ, such as *Anemone*, *Hepatica*, *Pulsatilla*, *Clematis* and *Thalictrum*, the ovular trace departs from the upper part of the ventral; in *Ranunculus* and *Trautvetteria*, the carpellar trace divides almost simultaneously at the base of the carpel into three—one dorsal and two ventrals, and the ovular trace departs from the base of the ventral. The ventral or the dorsal is often reduced, as was described on some species of *Ranunculus* by the present writer (1930 a), LONAY (1901), CHUTE (1930) and BROULAND (1935). In some species of *Anemone*, the ventral bundle is often divided into two before the ovular trace is inserted in the upper part of the carpel, and is not in the other species. The carpel of *Adonis* shows a transitional type between *Ranunculus* or *Trautvetteria* and *Anemone* in the be-

haviour of the ventral bundle and in the position of the ovular attachment.

The tribes Helleboreæ and Anemoneæ are, however, not always clearly distinguished in the mode of vascular supply to the carpel. According to BROULAND (1935) in *Leptopyrum fumarioides* REICHB., and to SMITH (1926) in *Isopyrum biternatum* TORR. et GRAY, for instance, the carpel has the vascular supply similar to that of *Anemone*. But the writer has found that the vascular supply in *Isopyrum dicarpon* MIQ. is quite similar to the normal type of Helleboreæ.

The case, in which two ventrals and one dorsal are connected at their base, was ascertained by TROLL (1933) to be normal in *Cimicifuga foetida* L., and by SMITH (1926) to be abnormal in *Aquilegia canadensis* L., although such a case has not been observed by the present writer in the same species. Two ventrals are sometimes connected at their base in *Helleborus niger* L. (TROLL, 1933; CHUTE, 1930) and *Caltha palustris* L.

In the usual cases of Helleboreæ, the ovules, enclosed by one carpel, are commonly 10—30 in number and arranged in two rows; in *Paeonia suffruticosa* ANDR., *Eranthis* and *Isopyrum*, however, only several ovules are often produced in a single carpel. Particularly in *Isopyrum biternatum*, only one ovule is often observed<sup>1)</sup>, according to the descriptions of BAILLON (1868) and SMITH (1926). *Callianthemum* and *Xanthorrhiza* always have two ovules, only one of which becomes mature. It is well-known that the carpel has only one ovule in all the genera of Anemoneæ, and that it has often 3—5 abortive ovules laterally inserted, besides the functioned one in the genera *Anemone*<sup>2)</sup>, *Hepatica*, *Clematis* and *Adonis*<sup>3)</sup>. It is a very interesting fact that the writer has found the abnormal cases in which two ovules of nearly equal size are developed in a single carpel of *Ranunculus asiaticus* L.

<sup>1)</sup> In *Isopyrum dicarpon*, the present writer has not found the case in which a single ovule alone is formed in one carpel.

<sup>2)</sup> The present writer has studied the following species: *Anemone altaica* FISCH. *A. japonica* SIEB. et ZUCC., *A. nikoensis* MAXIM., *A. narcissiflora* L., *A. flaccida* FR. SCHMIDT., *A. coronaria* L. Among these, the abortive ovules have not been observed in the last two species.

<sup>3)</sup> The abortive ovules were described by LONAY (1901), RASZNER (1931) and others in the European species; nevertheless, they have not been ascertained in the Japanese species *Adonis amurensis* examined by the present writer.

and of *Thalictrum kiusuanum* NAKAI.

Although only one seed ripens in *Xanthorhiza* and *Isopyrum biternatum*, the fruit of Helleboreæ is the follicle, while that of Anemoneæ is the achene.

Regarding the characters mentioned above, some transitional types are found between the tribes Anemoneæ and Helleboreæ: they are *Callianthemum* and *Isopyrum biternatum* in respect of the vascular supply to the carpel, and of the ovule reduction; *Leptopyrum* in respect of the vascular supply to the carpel which is multiovular; *Xanthorhiza* in respect of the ovule reduction. Besides these features, *Callianthemum* has the achene which is characteristic of the tribe Anemoneæ.

Among these characters mentioned above, the feature of the fruit is considered to be more significant than the other characters, because there is no transitional forms between the two tribes, though the genus *Actaea* in the tribe Helleboreæ has neither follicle nor achene, but has baccate and indehiscent fruits. *Callianthemum* is, therefore, regarded by the present writer as belonging to the Anemoneæ, though it was included by PRANTL and most of the recent authors into the Helleboreæ.

The ovule in this family is atropous, but that of *Callianthemum* is epitropous and that of *Hydrastis* heterotropous, as was described by the previous authors. These differences, however, are not fundamental, because they seem to the writer to be caused by the torsion of funiculus.

#### B. Berberidaceæ.

The morphological construction of the pistil in this family is yet uncertain and in this respect there are various theories proposed up to the present (SAUNDERS, 1925, 1928, 1931, 1937; CHAPMAN, 1936). CHAPMAN assumed that the pistil was constructed by three fused carpels in *Berberis*, *Mahonia* and *Caulophyllum* and by two fused carpels in all the other genera of the Berberidaceæ. Regarding this, the study of the present writer is now in progress and it is not treated in this paper, but the morphological differences of pistil between the Ranunculaceæ and Berberidaceæ will be described below.

As is already studied by PAYER (1857), BESSEY (1898), TROLL (1932, 1933) and others, the pistil of the Ranunculaceæ usually appears at first on the floral receptacle, as a projection with a ridge of the shape of a horse's hoof

and later the ridge, especially its dorsal part, elongates longitudinally; and in the *Paeoniae*, *Hydrastideae* and *Helleboreae* the ovules are formed on the lateral margin of the carpel; in the *Anemoneae*, whose carpel has the so-called "Querzone" and is of peltate nature, the ovule is developed on the median margin of the Querzone. The pistil thus formed has the evident ventral suture which is extended longitudinally from the stigma to the style or to the base of the pistil in the full-grown stage of the pistil (fig. 1; A-F). The papilous epidermal layers of the carpellar lateral margins are closely connected<sup>1)</sup> with each other at the ventral suture, along which the pollen tube is led.

In the *Berberidaceae* (fig. 1; G-O), however, the pistil at first appears on the floral receptacle as a circular ridge of a bowl shape, and primordial

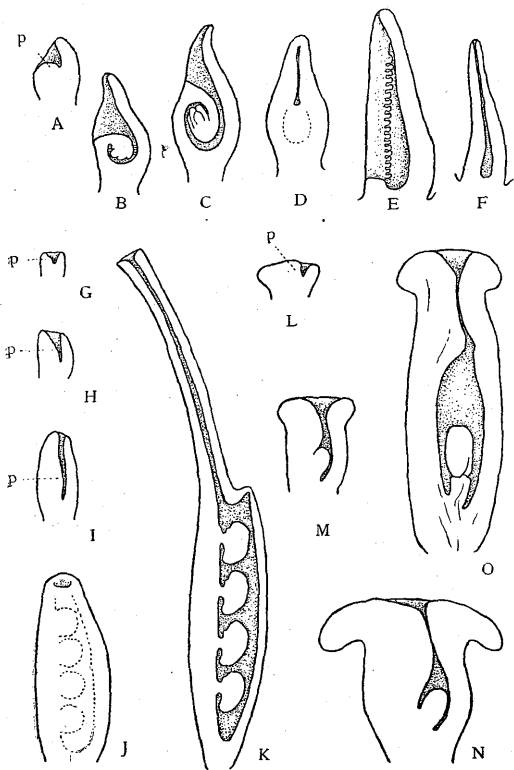


Fig. 1. Carpellar development in the Ranunculaceae and Berberidaceae.

A-D, *Thalicttrum aquilegiaefolium*. A-C, successive stages of development. Lateral view. D, ventral view of the carpel shown in C.

E, F, *Consolida ajacis*. Early stages of development. E, lateral view. F, ventral view showing the ventral suture.

G-K, *Epimedium macranthum* MORR. et DECNE. Successive stages of development. Lateral view. G-J,  $\times 30$ . K, full-grown stage.  $\times 10$ .

L-O, *Berberis Thunbergii* DC, var. *Maximowiczii* FRANCH. et Sav. Successive stages of development. Lateral view. L-N,  $\times 30$ . O, full-grown stage.  $\times 10$ . P, the part where later the ovules are differentiated.

A-D, after TROLL 1932. E-F, after EBER 1934. Others, original.

ovules appear on the inner lateral side of the bowl. Afterwards the bowl is extended longitudinally, and the full-grown pistil of cylindrical or bottle shape is formed. The capitate stigma corresponds to the margin of the bowl-shaped primordial pistil, and the ventral suture is not formed, the ovular position being laminar in contrast with the case of the Ranunculaceæ. This process of carpellar development is observed not only in *Epimedium*, *Plagiorhegma* and *Nandina* in which the placentation is parietal, but also in *Berberis*, *Mahonia*, *Caulophyllum* and *Achlys* in which the placentation is usually described as basilar.

The differences of the ovular position, parietal or basilar, are not fundamental, but are caused by the differences of the elongating zone in the pistil at its later stage of development. If the carpellar wall, where the primordial ovules are inserted, is extended longitudinally, the parietal placentation of ovules results, and if the upper part of the carpel, upper than the part where the primordial ovules are inserted, is extended extraordinarily, the so-called basilar placentation of ovules results. Therefore, the two types of ovular position are not fundamentally distinguished from each other: even in *Berberis*, *Mahonia*, *Caulophyllum* and *Achlys*, which are usually described as basilar, the ovules are, in reality, semibasilar, i.e. they are not typically basilar, but are slightly dislocated towards the lateral side in their position (fig. 1, O); in *Diphylleia* and *Ranzania* which are usually described as lateral, the ovules are, in reality, slightly dislocated towards the bottom of carpellar loculus. The parietal placentation in the Berberidaceæ is, therefore, considered, in all probability, to be the original type from which the basilar one is derived.

Comparing the carpellar development of the Ranunculaceæ with that of the Alismataceæ, BESSEY (1898) suggested some phylogenetic relationship between the two families, but his theory was denied by EBER (1934), for the reason that the carpel is of peltate nature in the Ranunculaceæ, while in the Alismataceæ, it is of epeltate nature and that the placentation is marginal in the former, in the latter it is laminar. As is stated above, the carpel of

<sup>1)</sup> In *Coptis*, the lateral margins of the carpel are not so closely connected with each other that the ovules are often visible from the outside.

the Berberidaceæ is of peltate nature and the placentation seems to be laminar when its developmental history is traced; in these respects, therefore, the Berberidaceæ resembles the Ranalian genera, i. e. *Ceratophyllum*, *Nelumbium* and a family of the Helobiæ, i.e. the Potamogetonaceæ studied by EBER (1934) rather than the Ranunculaceæ or Alismataceæ.

## II. Ovular Feature.<sup>1)</sup>

### A. External feature of the ovule.

The ovules of the Ranunculaceæ are typically anatropous in most genera; but they are hemitropous in some species of *Ranunculus* such as *R. trichophyllus* CHAIX., *R. flagellifolius* NAKAI (fig. 2; K-N), etc., though nearly anatropous in *R. asiaticus* L. and others.

The ovules have each, a very short funiculus in most genera, but they occur directly from the ridge of the placental tissue, having no funiculus in *Paeonia*, *Helleborus* and *Aquilegia*. The ovules of *Helleborus* (fig. 2; D, E) and *Aquilegia* (fig. 2; H, I) have the evident ridge extended longitudinally on their dorsal side; in other respects, there are no noteworthy structures on the ovule. The micropyle is small and firmly closed.

The ovule of *Paeonia* is extraordinarily large in size, and such a large ovule is neither found in the Ranunculaceæ nor in the Berberidaceæ.

In the Berberidaceæ, the ovules of *Podophyllum* (fig. 3; L, M) and *Ranzania* (fig. 3; H, I) are hemitropous, the funiculus being very short in the former genus and somewhat long in the latter. Those of all the other genera are typically anatropous, having thick funiculus of some length in *Berberis* (fig. 3; A, B), *Mahonia* and *Caulophyllum* (fig. 3, G), a very short funiculus in *Diphylleia* (fig. 3; J, K), *Epimedium* (fig. 3; C-E), *Plagiorhegma* and *Achlys* (fig. 3, F), and no funiculus in *Nandina* (fig. 3; N, O).

In *Berberis*, *Mahonia*, *Caulophyllum* and *Diphylleia*, the outer integument is projecting from its dorsal part near the hilum; therefore, the boundary between the funiculus and hilum is very evident.

The ovule of *Nandina* (fig. 3; N, O) is perfectly enclosed all around by the outer integument, thus the micropyle is never observed from the outside.

<sup>1)</sup> The studies have been made, as a rule, with the ovules in the stage in which the embryo-sac is nearly formed.

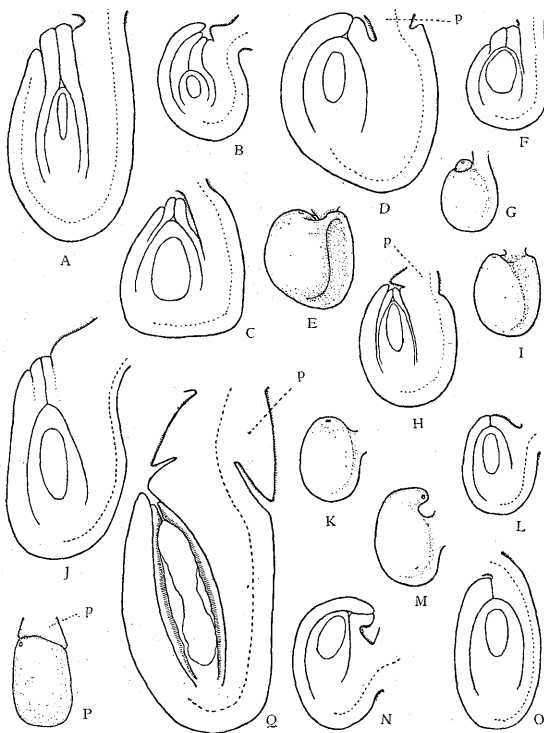


Fig. 2. Ovules in the Ranunculaceæ.

A, *Glaucidium palmatum* SIEB. et ZUCC. B, *Hydrastis canadensis* L. C, *Aconitum mitakense* NAKAI. D, E, *Helleborus niger* L. F, G, *Delphinium elatum* L. H, I, *Aquilegia canadensis* L. J, *Callianthemum Miyabeanum* TATEW. K, L, *Ranunculus Vernyi* FRANCH. et SAV. M, N, *Ranunculus flagellifolius* NAKAI. O, *Anemone flaccida* FR. SCHMID. P, Q, *Paeonia suffruticosa* ANDR.

Intraseminary and funicular bundles are indicated by broken lines. The palisade tissue of the integument (Mantelgewebe), found in Q, is shaded. Most parts of the nucellar tissue are absorbed in Q. P, placental tissue. Q,  $\times 15$ . All others in section,  $\times 30$ .

Such a type of ovule is neither observed in the Ranunculaceæ nor in the Berberidaceæ.

The arillus which is found in *Jeffersonia*, *Plagiorhegma* and *Epimedium* (fig. 3; C-E, a) is differentiated in first at the dorsal part of the ovule near the hilum. Its structure was already described by CITERNE (1892).

#### B. The integument.

The number of the integuments, one or two, is systematically one of the significant characters, and it is a remarkable and well-known fact that both the unitegument and bitegument types are found equally often in the Ranunculaceæ. Although the number of integuments was studied with many genera by BAILLON (1861), PRANTL (1887), LONAY (1901), WARMING (1879, 1913) and others, it is still left undecided in some genera; and the present writer himself has ascertained the occurrence of two integuments in the follow-



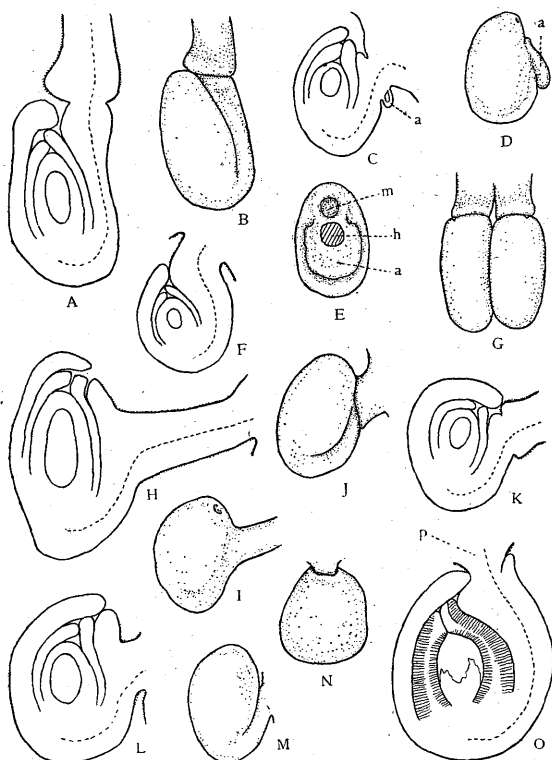


Fig. 3. Ovules in the Berberidaceae.

A, B, *Berberis Thunbergii* DC, var. *Maximowiczii* FRANCH. et SAV. C-E, *Epimedium Macranthum* MORR. et DECNE. E, view from the side of hilum (h). F, *Achlys japonica* MAXIM. G, *Caulophyllum thalictroides* MICHX. var. *robustum* REGEL. Ventral view. H, I, *Ranzania japonica* ITO. J, K, *Diphylleia Grayi* SCHMIDT. L, M, *Podophyllum peltatum* L. N, O, *Nandina domestica* THUNB. In O, the palisade tissue of the integument (Mantelgewebe) is shaded, and most parts of the nucellar tissue are absorbed. a, arillus. m, micropyle. h, hilum. p, placental tissue.

A, C, F, H, K, L, O,  $\times 30$ .

ing genera: *Paeonia* (Paeoniæ), *Hydrastis* and *Glaucidium* (Hydrastideæ), *Caltha*, *Trollius*, *Eranthis*, *Nigella*, *Isopyrum*, *Coptis*, *Anemonopsis*, *Actaea*, *Cimicifuga*, *Aquilegia*, *Semiaquilegia*, *Delphinium*, *Aconitum* and *Callianthemum* (Helleboreæ)<sup>1)</sup>, *Thalictrum*, *Adonis* and *Anemonella* (Anemoneæ); and the occurrence of one integument has been ascertained in *Helleborus niger* L., *Ranunculus*, *Anemone*, *Hepatica*, *Pulsatilla* and *Clematis* (Anemoneæ)<sup>2)</sup>.

In the genus *Helleborus*, the existence of a single integument is ascertained in *H. niger* L., *H. viridis* L., and *H. corsicus* WILLD. by WARMING (1913) and others; while according to LONAY (1901), the integument of *H. foetidus*

<sup>1)</sup> According to LONAY (1901), *Leptopyrum* has also two integuments.

<sup>2)</sup> According to the previous authors, the ovule is also of the unitegument type in *Myosurus*, *Oxygraphis*, *Ceratocephalus* and *Ficaria*, although it was not been studied by the present writer.

L. is very slightly bilobed at its end in the early stage of ovular development, but later it completely fuses together.

In the genus *Delphinium*, the fact has been ascertained by STRASBURGER (1872), WARMING (1878, 1913) LONAY (1901), VAN TIEGHEM (1901) and others that the integument is slightly bilobed at its end in some species such as *D. elatum* L., *D. nudicaule* TORR. et GRAY, *D. Staphisagria* L., etc. This type of integument (fig. 2, F. G) has been described as unitegument by some authors and as bitegument by others; in this paper, however, such integument with lobes at its end is described as bitegument.

GOEBEL (1923, p. 1934), SCHNARF (1931, p. 6) and others consider that the bitegument type is primitive and the unitegument is phylogenetically derived from it in the Ranunculaceæ.

Ontogenetically speaking, in the case of *Delphinium elatum* L., a lobe of the outer integument, at first, differentiates on a primordial integument, which later elongates towards the top of the nucellus, but the lobe of the outer integument does not elongate further. According to STRASBURGER (1872), a primordial integument afterwards becomes bilobed at its end, thus the outer and inner integuments are formed. The integument with such a slightly bilobed end found in *Delphinium*, is usually stated by the previous authors to be fused; in fact, however, it is theoretically more reasonable to say that the differentiation of two integuments is suppressed, because the process of their fusion is not ascertained ontogenetically.

LONAY found in *Eranthis hyemalis* SALISB. that the two integuments are not distinguished as two in their basal part. The present writer has found such a feature also in *Eranthis pinnatifida* MAXIM., *Aconitum mitakense* NAKAI (fig. 2, C), *Anemonopsis*, *Callianthemum hondoense* NAKAI et HARA, ment is very slightly bilobed only at its end, the differentiation of the inner and outer integuments being suppressed.

In the genera of the Helleboreæ and Anemoneæ, the inner integument and *C. Miyabezanum* TATEW. (fig. 2, J); especially in the last genus, the integument usually consists of two cell-layers except in the micropylar part, and the outer integument, of from four to six; therefore, the integuments, as a whole, are from six to eight cell-layers thick. In the unitegument genera

of the *Anemoneæ*, the integument is also from six to eight cell-layers thick, except in *Ranunculus* whose integument usually consists of four cell-layers.

The integuments of *Paeonia* (fig. 2, Q) are very thick, the inner one about four cell-layers thick, and the outer one from fourteen to twenty cell-layers; the outermost cells of which dividing repeatedly in the radial direction in the later stage of development of the ovule. The ovule is clearly distinguished by its enormous size and by the thickness of its outer integument from that of all the other genera of the *Ranunculaceæ* or of the *Berberidaceæ*.

The integuments of *Glaucidium* are also thick, the inner one being five cell-layers thick, and the outer one about nine; however, *Hydrastis*, which is systematically akin to *Glaucidium*, is the same with the other genera and differs from *Glaucidium* in respect of the thickness of the integument.

In the *Berberidaceæ*, the inner integument is two cell-layers thick, and the outer one about five in the case of *Podophyllum*, *Diphyllia*, *Epimedium* and *Achlys*; both integuments are thicker in the other genera. In this family, the outer integument is always very strongly differentiated and encloses the inner integument all around. In the *Ranunculaceæ*, however, the outer integument is usually shorter than the inner one, whose end is visible from the outside with the exception of some genera.

In *Paeonia* (fig. 2, O) and *Hydrastis* (fig. 2, B), the outer integument is longer than the inner one as in the *Berberidaceæ*; while in *Glaucidium* (fig. 2, A), the fact is quite the reverse, the outer being remarkably shorter in contrast with the description of PRANTL (1891). Although PRANTL described that the outer integument is not longer than the inner one in the tribe *Helleboreæ*, the former is usually longer than the latter in all the species of *Aquilegia* (fig. 2, H, I) here studied. In *Nigella* and *Semiaquilegia*, both integuments are nearly the same with each other in their length.

Therefore, the writer comes to the conclusion that the length of the integument is not to be regarded as one of the distinguishing characters of the tribes of the *Ranunculaceæ*.

#### C. The nucellus and the palisade tissue of the integument.

The nucellus of the *Angiosperms* is classified by Van Tieghem (1898) into the crassinucellate and tenuinucellate types or by Warming (1913). into the

eusporangiate and leptosporangiate types. The differences between these types were based on the thickness of the nucellus, the presence or absence of the wall cells and the uniseriate or multiseriate nature of epidermis. In the families now studied, the nucellar tissue is usually represented, at the time of blooming, by a few cell-layers, at least in the part near the micropyle, and it is so even in the case of the crassinucellate type, for the nucellar tissue, except a few outer cell-layers, is absorbed. In the mature seed, the nucellar tissue is, as a rule, degenerated or destroyed.

In the genera *Paeonia* (fig. 2, Q) and *Nandina* (fig. 3, O), however, the nucellar tissue, especially in the part near the micropyle, is already absorbed, and the embryo-sac is directly enclosed by the inner integument before the flower comes to bloom. At the time of blooming, moreover, the epidermis of the inner integument—the inner epidermis in the former genus, the inner and outer in the latter—is metamorphosed into thin-walled columnar or palisade tissue of some thickness, i.e. the so-called Mantelgewebe.

It is an interesting fact that such a feature is not found in any other genus of the Ranunculaceæ and Berberidaceæ, though an indication of the feature, not so evident as in the foregoing two genera, is observed in *Caulophyllum*. According to SCHNARF (1931), these characters of the integument and nucellus are usually observed in the families of Sympetalæ, rarely in a few families of Choripetalæ and never in any family of Polycarpicæ. Therefore, they seem to the writer to be one of the phylogenetically significant characters, and *Nandina* and *Paeonia* may be more deviated from the other genera of the Berberidaceæ or Ranunculaceæ even in these respects.

#### D. The intraseminary bundle.

Although the intraseminary bundles are found in many families which are systematically much separated from each other, they are regarded by WETTSTEIN (1935) and others as one of the primitive characters of the Angiosperms.

They were ascertained by KÜHN (1926) only in *Anemone* among the genera of Ranunculaceæ and Berberidaceæ then examined. In the studies of the present writer, the occurrence of the bundles has been ascertained in *Ane-*

*mone coronaria* L., *A. stolonifera* MAXIM. and *A. narcissiflora* L., but not in *A. altaica* FISCH., *A. japonica* SIEB. et ZUCC., *A. flaccida* FR. SCHMIDT and *A. ovule* whose outer integument is shorter than the inner one, and differs in *nikoensis* MAXIM.

The writer has found the bundles also in *Glaucidium* (fig. 2, A), the only example besides *Anemone*. The intraseminary bundle in this endemic genus is strongly developed in the outer integument from the chalaza to the part near the micropyle as a single strand.

### III. Summary.

1. In this paper, the carpellar features, the ovular position and structure in the Ranunculaceæ and Berberidaceæ have been examined.

2. There are some transitional types between the tribes Helleboreæ and Anemoneæ in respect of the characters of the ovule and carpel. Among these characters, however, the feature of the fruit, follicle or achene, is more significant than the other characters of the tribes, and *Callianthemum* belongs, without doubt, to the tribe Anemoneæ.

3. In the Ranunculaceæ, the pistil has the ventral suture, and the ovular position is marginal; while in the Berberidaceæ the pistil has no marked ventral suture, the ovular position is laminar; therefore, there is no relationship between these two families in respect of these features.

4. In the Berberidaceæ, the primordial ovules appear on the lateral wall of the pistil in the earliest stage of development in all the genera. The basilar placentation found in some genera is formed ontogenetically through such a stage of lateral position by the enormous elongation of the upper sterile part of pistil. Therefore, the parietal placentation is considered to be the original type.

5. The number of the integument has been examined in each genus. In some genera such as *Helleborus*, *Delphinium*, *Eranthis*, *Anemonopsis*, *Aconitum* and *Callianthemum*, the inner and outer integuments are not clearly distinguished from each other at their base, or the integument is bilobed only at its end. But it is not a reasonable statement, from the ontogenetical point of view, that the two integuments are fused together in such a case.

6. The relative length of the inner and outer integuments is not definite even in one and the same tribe of the Ranunculaceæ. *Glaucidium* has the this respect from *Hydrastis* which belongs to the same tribe. Most genera of the tribe Helleboreæ, have the outer integument shorter than the inner one, while *Aquilegia* alone in the tribe has the integuments with are quite the reverse in their relative length.

7. The intraseminary bundle has been found in *Glaucidium* and *Anemone* among the genera examined in the present study.

8. In the ovule of *Paeonia* and *Nandina*, the nucellar tissue is absorbed and the epidermal layer of the integument is metamorphosed into the palisade tissue, i. e. the so-called Mantelgewebe, before the flower comes to bloom. These characters are considered to be of phylogenetical significance. From the comparative studies of the ovule, it has been suggested that the genera *Paeonia* and *Nandina* are considered to belong to other lines of evolution deviated from the typical members of the Ranunculaceæ or Berberidaceæ.

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## Notes on Japanese Musci (I)

By

Akira NOGUCHI

野口 彰：日本産蘚類ノ研究（其一）

### 1) *Coscinodon humilis* HORIKAWA et NOGUCHI, sp. nov. (Fig. 1)

Dioicus. Planta humilis, dense caespitosa, atro-viridis, canescens. Caulis erectus, simplex vel dichotome ramosus, ca 5 mm altus, dense foliosus. Folia sicca adpressa, madida patentia, anguste oblongo-lanceolata, acuminata, longe flexuosum pilosa, carinato-concava, non plicata, dorso non lamellosa, ad 1.5 mm longa, inferiora breviora, epilosa, marginibus integerrimis, costa continua, cellulis laminaribus subobscuris, minutis, parietibus crassis, mediis breviter rectangularibus vel quadratis,  $7.5-11 \times 7-8 \mu$  in diam., superioribus plerumque quadratis, basilaribus rectangularibus, pellucidis, ca  $22 \times 10 \mu$ , parie-